



A model of political voting behaviours across different countries



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HIGHLIGHTS

- From the data, two types of general voting behaviours are found.
- A three-state Markov model provides a good fit for the time dependent data.
- Phenomenological behaviours are tested on a stochastic model reproducing the data.
- Both leader and social network influences are required to understand voter behaviour.

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ABSTRACT

This paper analyses, models mathematically, and compares national voting behaviours across seven democratic countries that have a long term election history, focusing on re-election rates, leaders' reputation with voters and the importance of friends' and family influence. Based on the data, we build a Markov model to test and explore national voting behaviour, showing voters are only influenced by the most recent past election. The seven countries can be divided into those in which there is a high probability that leaders will be re-elected and those in which incumbents have relatively less success.

A simple stochastic phenomenological dynamical model of electoral districts in which voters may be influenced by social neighbours, political parties and political leaders is then created to explore differences in voter behaviours in the countries. This model supports the thesis that an unsuccessful leader has a greater negative influence on individual voters than a successful leader, while also highlighting that increasing the influence on voters of social neighbours leads to a decrease in the average re-election rate of leaders, but raises the average amount of time the dominant party is in charge.

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1. Introduction

Understanding national voting behaviour and analysing various influences on voters has a long history of research in terms of developing fair election systems [1–4], but also due to it being a complex system [5–7]. In order to explore these various influences, several models (both sociological and mathematical) have been proposed looking at basic forms and constitutions of Government [8–12], voter systems [13–17] and election behaviours [18–24].

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Research on voting behaviour [25–30] has shown that the reputation of a political party's leader has an influence on voters. Studies frequently show that a leader's unsuccessful reputation reduces the chances of re-election more than a successful one enhances them [25,27,29,31]. Voters' perceptions of leadership also shape their evaluation of party policy [26–30].

Differences between voting behaviour in various countries have also been observed due to a variety of cultural and constitutional differences. In the past, voters in the United Kingdom and Australia have tended to be more influenced by factors including class, age, gender, religion, and ethnicity [32–34], whereas western European voters tend to elect parties that present clear political alternatives [16]. On the other hand, it has been shown in the past that American voters were strongly influenced by their family's party preferences [35]. It has also been shown that the type of election process used has a stronger influence on voting behaviour than historical or cultural background [24]. Hence, there is a complex interaction of factors and influences determining the outcome of individual elections.

In order to untangle this intricate mix of reasons for voter behaviour, several simple conceptual voting models have been proposed. One of the first was proposed by Campbell et al. [36], who used the layout of the funnel of causality model to describe voting behaviour in a two-party system at a point in time, such that current understanding of voting influences can be understood. In Campbell et al.'s model, voters inherit their political party preference from their parents, which influences the individual's future affiliation's to a party, the issues of domestic and foreign policy and also compares how the two parties deal with governmental affairs. This simple model was able to predict 87% of voting decisions, suggesting that American voters are significantly more influenced by their families than by party policy. However, Campbell et al.'s conclusions have been criticised on the grounds that they used unrepresentative election results from the 1950s and that voters are modelled as uninformed and lacking interest in politics, with the result that every voter's party preference was represented as being entirely dependent on loyalty towards a party to the exclusion of other individual influences, such as class, age and gender [37]. Furthermore, national influences such as the perception of a leader or media are not included but are known to have major impacts on voter behaviours; see Ref. [25]. Despite all these issues, Campbell et al.'s model is widely used due to it explaining a large part of American voter behaviour and supporting the hypothesis that American voters are "mostly" influenced by their immediate social network.

Galam [19–21,38] proposed several simple mathematical voter models in order to investigate the effect of various individual influences on group decision and voting. Instead of analysing party preferences, his hierarchical model analyses the election process where voters choose one of the two proposed policies. Random voters are then selected to represent the policy in the above hierarchical level, where they gather together to form various groups. Each voter selected keeps their policy preference, but again, one of the elected in each group is randomly chosen and put forward into the following level. This process continues until only one member is elected to represent their policy [19,38]. Galam proposed using the statistical physics Ising model to describe how voters make policy choices [20]. In the simplest form of this model, the voters can choose between one of two policies and a voter's preference is influenced by an initial choice and the votes of their closest neighbours, e.g. family/friends. It is found that depending on the strength of the influence of a voter's immediate social network one either observes the group of voters selecting one policy with a 50% preference, or (for strong influence) regions where voters all vote for one policy, i.e. segregation.

While these voting models have allowed researchers to investigate some of the fundamental underlying mechanisms for voter behaviour, the models generally only capture local individual influences on voter behaviour and ignore the national influence of media/leaders. Furthermore, we wish to develop models that explore conceptual mechanisms for voter behaviour while also being able to reproduce gross averages of the election data.

The aim of this paper is to first look at election rates of seven different countries with a long democratic election history. Although it is known that the election type does have an impact on voting behaviour [24], these have only been imposed in the past few decades. Therefore for us to analyse a larger set of election results, this research ignores the precise type of election process. We will concentrate on election averages rather than individual elections throughout this paper hence the effect of precise election policies/manifestos will be significantly reduced. We carry out a detailed data analysis by fitting a simple three-state Markov model to the election data describing the transition from first-time elected, re-election once and re-elected multiple times of individual leaders and parties, which suggests that a fundamental mechanism for voter behaviour is based on how many times a leader or party has been elected and that a suitable time-scale is per election. Furthermore, we are able to carry out a detailed analysis and comparison of voting behaviour in the seven different countries. Since we concentrate on election averages and have largely ignored policies/constitutions, one possible explanation for the similarities and differences seen in the voting behaviour is due to the influence of social network and a leader's reputation on individual voters. In order to investigate this hypothesis, we construct a voting model that incorporates the fundamental voter mechanism analysis with the influence of family/friends/etc. and a leader's reputation on voters using a 2-D Galam's model as a basis. The voting model carries out time steps every election and is inline with the time-scale found from the Markov model analysis. We then compare our voting model to the election averages to investigate different national voting behaviours.

Neither the Markov model or voting model takes the choice of constitution into account, even though it is known that it does impact the voting turn out and indirectly the national voting behaviour. While our models will be very simple, we find that we can draw several important conclusions about various national voting behaviour and some basic voting mechanisms. Crucially, we note that we are not attempting to predict a single election but rather explain some common mechanisms for voter behaviour that can explain the similarities and differences seen across different countries.

The outline of the paper is as follows. With the aid of a Markov model, Section 2 analyses the data on the seven national election histories. In Section 3 a voting model is constructed and simulated to investigate the combined effects of a leader's

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